

No. 1.— *A Section in the Trenton Limestone at Martinsburg, New York.*

By THOMAS H. CLARK.

MARTINSBURG is a small town situated in Lewis Co., N. Y., west of the Adirondacks and east of Lake Ontario. It lies just within the northwestern corner of the "Port Leyden quadrangle," the geology of which has been described by Prof. W. J. Miller (N. Y. state mus. Bull. 1910, 135). The village is situated upon the upper of two prominent terraces facing the Black River, and at an elevation of about 500 feet above it. The contact of the Pre-Cambrian gneiss with the sediments is along the western margin of the alluvial plain of the Black River, and the terraces are underlain by Ordovician limestone which dips gently westward.

The summit floor of the terrace upon which Martinsburg stands varies in width from one to two miles, and between it and the level land along the Black River is a steep slope broken by a narrow but pronounced shelf developed on the surface of the Black River limestone. In this slope Roaring Brook has cut a deep trench, which affords a fresh and almost continuous section of the Ordovician limestone. The exposures along this brook make up the greater part of the section here described, but as the rocks are largely concealed along its upper stretches, outcrops along the road and old quarries near the village of Martinsburg were also studied.

In the Bulletin mentioned above, Miller has given a detailed section of the strata below the Trenton, but concerning that formation he gives no information beyond the estimate of 475 feet for the total thickness.

Dr. Raymond visited this section in 1912, and has called attention (Summary report Director Geol. survey, Department of mines, Canada, for 1912, 1914, p. 345) to its importance in the correlation of the Trenton of the typical section at Trenton Falls, N. Y., with the supposedly equivalent deposits in Ontario. His work indicated the desirability of more detailed study of the section, and at his request I spent two weeks in the area in 1916, and visited it again for a short time in 1917.

THE SECTION.

For convenience, the beds of the section will be described in ascending order.

The hard cherty Black River limestone has resisted erosion more

successfully than the rather thinly bedded Trenton limestone above it, so that a platform a quarter of a mile wide has been excavated upon its surface. Since the surface of this platform, even in the stream bed, is more or less masked by debris from the bluff behind it, the exact contact with the Trenton is seldom seen. Fortunately, however, I found on my second visit that the spring freshets of 1917 had removed a part of the covering of detritus in the stream bed, so that the basal twelve inches of the Trenton was clearly shown. This proved to be a dark blue, fine grained dense limestone, mostly without fossils, but with here and there a thin band of small specimens. This bed was without shaly partings to divide it into subordinate layers, and showed no trace of clastic matter, so there was no evidence of a "basal conglomerate." It differed from the underlying Black River limestone in being finer grained with a more flinty fracture, and in lacking the chert. The few fossils obtained from it are species characteristic of the Trenton, *Triplecia extans* being the most important.

Above this basal layer there would seem to be about five feet of strata concealed, the next outcrop being in the bank of the stream about halfway across the shelf. At this locality a few thick beds of highly fossiliferous dark blue impure limestone are exposed, with rather thick bands of shale between the beds of limestone. The following were the most common fossils, the first three being particularly diagnostic, and, in this section, apparently confined to the lower ten feet of the Trenton:—

Triplecia extans (Emmons), *T. cuspidata* (Hall), *T. schucherti*, sp. nov., *Parastrophia hemiplicata* Hall, *Rafinesquina alternata* (Emmons), *Subulites elongata*. Conrad, *Hormotoma trentonensis* Ulrich & Scofield, *H. bellicincta* (Hall), *Streptelasma corniculum* Hall.

The last species was particularly abundant; one slab, about thirty-six square inches in area, containing about forty specimens on its surface. From the partings between the beds of limestone, large numbers of complete specimens of *Triplecia*, retaining both valves, were obtained.

Above the fossiliferous basal beds there are about 280 feet of dark limestone in beds two inches to a foot in thickness, separated by partings of shale which become more numerous and thicker in the upper part of this division, but which seldom contain any great number of fossils. Some of the beds of limestone are composed of fine grained material, while others contain a certain amount of more coarsely crystalline calcite. In the latter case the crystallization affects only the matrix, and does not obscure the fossils. Some of

the layers are made up almost entirely of fragments of shells, a sort of coquina, while others are nearly or quite devoid of fossils.

The peculiarities of the distribution of fossils in these strata are as follows:—

At seventy feet above the base of the Trenton there is a layer, exposed on the road from Martinsburg to East Martinsburg, which contains great numbers of *Sinuities cancellatus* (Hall).

One hundred feet above the base there is a layer containing, among other fossils, *Dalmanella rogata* (Sardeson), *Isotelus gigas* DeKay, *Calymene senaria* Conrad, *Cryptolithus tessellatus* Green.

This layer is found near the base of the upper of the three falls which have been developed by Roaring Brook in the lower part of the Trenton, and five feet above the broad flat platform which extends from the top of the middle fall to the base of the upper one. The layer containing *Cryptolithus* is only a few inches thick, and is a fairly pure, nearly black limestone. *Cryptolithus* is quite abundant and its discovery here is of considerable interest as it has not previously been reported in the Trenton north of Trenton Falls in the region west of the Adirondacks.

In the strata 100 feet above the base *Platystrophia* first becomes abundant, and the fifteen feet above the 165 foot level contain especially well-preserved specimens. Associated with the *Platystrophia*s are the other common fossils of the Trenton, such as *Calymene senaria*, *Dalmanella rogata*, *Plectambonites sericeus*, etc.

Between the 200 and 300 foot levels the limestone is composed of little else than fragments of shells, and at 280 feet is the lowest layer of coarsely crystalline limestone. Large specimens of an undescribed *Dalmanella* are found in this stratum, and as usual, only the matrix and not the fossils is affected by the crystallization. At 290 feet there is a layer showing the so-called "giant ripple mark," the crests being several feet apart, and their direction about N. 45° E. The rock is composed of columnals of crinoids and fragments of brachiopods. In the hundred feet of beds just described there are no very remarkable fossils, but it is the zone of the greatest development of *Prasopora simulatrix*, which is there very common indeed.

Between 300 and 390 feet above the base the rocks are a rather coarsely crystalline limestone which is neither very well exposed nor, apparently, very fossiliferous. In the basal layer I found a *Carneyella*, the first representative of the *Agelacrinitidae* to be reported from the Trenton of New York; and this layer is also the lowest bed in which *Rafinesquina deltoidea* is found.

	Base	5	15	20-30	70	100	165-180	210	245	270-280	290	300	390	400	410	420	440	Upper Trenton
<i>Trematis terminalis</i> (Emmons)							×			×								
<i>Schizocrania filosa</i> Hall			×		×	×						×						
<i>Plectorthis</i> sp.																		×
<i>Platystrophia</i> sp. nov.			×															
"biforata"						?	×			×		×	×	×	×	×		
<i>colbyensis</i> Foerste								×				×	×	×	×	×		
<i>Dalmanella rogata</i> (Sardeson)		×	×	×		×	×			×		×			×	×		×
sp. nov.										×								
<i>Dinorthis pectinella</i> (Emmons)		×		×						×		×				×		
<i>Plectambonites sericeus</i> (Sowerby)		×	×	×		×				×		×	×	×	×	×		×
<i>Rafinesquina alternata</i> (Emmons)		×	×	×			×	×				×		×		×	×	×
<i>deltoidea</i> (Conrad)												×				×	?	×
<i>camerata</i> (Conrad)													×		×		×	×
<i>minnesotensis</i> (N. H. Winchell)				×									×					
<i>Strophomena filitexta</i> Hall				×									×	×	×	×		×
<i>trilobata</i> (Owen)													×	×	×	×		×
<i>Triplecia cuspidata</i> (Hall)		×																
<i>extans</i> (Emmons)		×	×															
<i>schucherti</i> Clark		×																
<i>Parastrophia hemiplicata</i> Hall		×		×						×				×				
<i>rotunda</i> (Winchell & Schuchert)		×																
<i>Rhynchotrema increbescens</i> (Hall)																		×
<i>Zygospira recurvirostris</i> (Hall)						×	×			×			×					
GASTROPODA																		
<i>Sinuites cancellatus</i> (Hall)			×	×	×								×		×			
<i>Sinuites cancellatus</i> v. <i>corrugatus</i> (Hall)					×													
<i>Phragmolites compressus</i> Con.	×	×	×															
<i>Tetranota bidorsata</i> (Hall)		×																
<i>Pleurotomaria</i> (<i>Trochonema</i> ?) <i>ambigua</i> Hall					×													
<i>Lophospira serrulata</i> (Salter)		×													×			
<i>Hormotoma trentonensis</i> Ulrich & Scofield		×			×					×		×	×		×		×	

	Base	5	15	20-30	70	100	165-180	210	245	270-280	290	300	390	400	410	420	440	Upper Trenton
<i>Hormotoma bellicincta</i> (Hall)	...	×
<i>gracilis</i> (Hall)	?	×	?
<i>Liospira americana</i> (Billings)	×	×	...	×	...	×	×
<i>Raphistoma rotuloides</i> (Hall)	...	×	...	×
<i>Trochonema umbilicatum</i> (Hall)	×	...	×	...
<i>Gyronema percarinatum</i> (Hall)	...	×
<i>Holopea obliqua</i> Hall	...	×	×
<i>Subulites elongatus</i> Conrad	...	×	×	×	×
PELECYPODA																		
<i>Ctenodonta nasuta</i> (Hall)	×
<i>levata</i> (Hall)	×
<i>Whitella subtruncata</i> (Hall)	×
<i>Ambonychia amygdalina</i> Hall	×

CORRELATION

Obviously this section should first be compared with that at Trenton Falls, which is about sixty miles south of Martinsburg. Comparing it with the composite Trenton Falls-Rathbone Brook section, published by Raymond, (Bull. M. C. Z., 1916, 56, p. 253), it appears that the Trenton at Martinsburg is 129 feet thicker than at Trenton Falls. The discovery of *Cryptolithus* at Martinsburg gives a much better basis for comparison of the two sections than was previously to be had. In the typical section, the highest layer with *Cryptolithus* is seventy-three feet above the base, while at Martinsburg it is 100 feet above. At Trenton Falls, *Rafinesquina deltoidea* appears 228 feet above the base of the Trenton; at Martinsburg the lowest layer containing this species is 300 feet above the base. In both sections the strata between those characterized by these "guide fossils" are layers of thinly bedded dark limestone alternating with beds of shale one or two inches in thickness, the fauna in both cases being composed of large numbers of the more common Trenton fossils, particularly *Prasopora simulatrix*, *Dalmanella*, *Plectambonites*, *Platystrophia*, *Calymene*, *Ceraurus*, and *Isotelus*. The similarity of the strata and

the occurrence of these three zones in the same order are, I believe, sufficient to indicate the correctness of the correlation of the portions of the sections occupied by these faunas, even though the zones of the two localities are not of the same thickness. The lower 390 feet of the section at Martinsburg are therefore probably the equivalent of the total 346 feet of the combined Trenton Falls-Rathbone Brook section, and the upper eighty-five feet of the section at Martinsburg have no equivalent in the limestone of the more southern section, but form a younger deposit. This is the view already advanced by Raymond, but supported by less evidence.

While the general correlation between these two sections is obvious, detailed correlation is attended with difficulties, and probably should not be attempted until the intervening region can be studied. While *Cryptolithus tessellatus* occupies a zone about forty feet thick in which it is abundant over a stretch of more than a thousand miles from east of Quebec down past Montreal, the Champlain Valley, Saratoga, and the Mohawk Valley to Rathbone Brook, at Martinsburg it is found in only a single layer, and that twenty to thirty feet higher in the section than it is normally found. Its western migration was evidently delayed, and finally stopped by something other than a physical barrier, but just what it was is not evident. At Martinsburg the lowest beds are characterized especially by three species of *Triplecia*. At Trenton Falls one of these species, *T. extans*, is quite common in one layer, but that layer is about seventy-five feet above the base, and above the range of *Cryptolithus*, and not below it. The meaning of this interchange of position is likewise not yet understood.

The occurrence of *Triplecia* in the lowest zone at Martinsburg is of value in making a correlation with the Trenton of Ontario. In the section at Ottawa and vicinity (Raymond, Guide book 3, Excurs. 12th Internat. geol. cong. 1913) one finds at the base thirty-five feet of limestone with *T. extans*, *Phragmolites compressus*, and other fossils; in the middle a thick zone with numerous fossils including an abundance of *Prasopora simulatrix*. Then come two zones characterized by *Rafinesquina deltoidea* and *Strophomena trilobata* respectively, the general sequence being that at Martinsburg but with a different development of the zone between that of *Triplecia* and that of *Prasopora*.

These notes should suffice to show the great importance of the Martinsburg section, since by combining in itself elements of the faunas of the Trenton to the north and the Trenton to the south, it permits a correlation which has formerly been in doubt. Perhaps

the most significant feature is the demonstration of the fact that the strata at Martinsburg, containing the fauna with *Strophomena trilobata*, gastropods, and *Streptelasma*, the so-called "Fusispira beds," are younger than any of the limestone in the section at Trenton Falls. This has a far-reaching effect, for the Fusispira beds extend across Ontario and appear as the upper part of the Prosser limestone in Minnesota, Wisconsin, and Iowa.

DESCRIPTION OF NEW OR INTERESTING SPECIES.¹

COELENTERATA.

STREPTELASMA CORNICULUM Hall.

Streptoplasma corniculum Hall, Pal. N. Y., 1847, 1, p. 69, pl. 25, fig. 1a-1e.

This species is one of the commonest in the lowest beds, but does not appear again until horizon 390 is reached. Here, and again at 400, 410, and 440 feet above the base it is fairly abundant. Although the specimens from the upper part of the Trenton are generally larger than those from the basal beds, I cannot determine any specific difference between them. By making transverse and longitudinal sections of large individuals I satisfied myself that these show in their younger stages the characteristics of Hall's species (now abandoned) *S. parvula*. The specimens from the upper part of the Trenton are well preserved, while those from the basal beds are for the most part badly crushed. It was in these beds that I found this species in such great abundance. One slab of rotten shale, about one quarter of a square foot in area had on its surface no fewer than forty specimens.

ECHINODERMATA.

CHEIROCRINUS ANATIFORMIS (Hall).

Plate 1, fig. 17.

Echino-encrinites anatiformis Hall, Pal. N. Y. 1847, 1, p. 89, 318, pl. 29, fig. 4a-4f.

The discovery of a few specimens of this rare species is of interest, since the exact horizon of the fossil has not previously been known. Hall stated that his specimens were from the "midst of the fossil-

¹ Bull. 92, U. S. N. M. contains an extensive bibliography of the various species here discussed.

ferous portion of the Trenton limestone" at Turin, Lewis Co., N. Y. I found a single plate, not absolutely identifiable, in the zone with *Cryptolithus*, 100 feet above the base of the section, but better and readily recognizable specimens were found in the Upper Trenton, from 390 to 410 feet above the base. It seems probable that this is the true horizon of the species. A species of *Cheirocrinus*, named *C. walcotti* by Jaekel (*Stammesgesch. Pelmat.*, 1899, p. 221, pl. 11, fig. 8) is very common in certain layers low in the upper third of the Trenton at Trenton Falls and, therefore, at a somewhat lower horizon than the *Cheirocrinus* at Martinsburg. The name was proposed by Jaekel largely because *C. anatiformis* was so poorly described as to be almost unrecognizable, and a comparison of specimens shows that there is very little if any difference between the two species. The specimens from Martinsburg show the numerous pectinirhombs which were ignored by Hall in both illustration and description, and one which retains the plates of the upper part of the calyx shows a series of small plates covering the ventral grooves. That Jaekel was right in referring this species to *Cheirocrinus* instead of *Echinoencrinites* is obvious.

CARNEYELLA RAYMONDI, sp. nov.

Plate 1, fig. 18, 19.

Specimen small, nearly circular in outline, with a peripheral ring one fourth of the diameter in width. There are six rays, five of which are straight, but ray II is bifurcated about one third the distance from the center to the peripheral ring, and the anterior branch curved in a contrasolar direction. The supraoral plates are damaged, and only three can be seen, but these are large, fully three times as large as the lateral covering plates. Their outlines are mostly obliterated. The interradial plates are covered with relatively large imbricating plates, but unfortunately the anal interradius is so poorly preserved as to obscure the anal pyramid. None of the rays shows any trace of auxiliary covering plates. The type (M. C. Z. 3,978) and only known specimen is 8 mm. in diameter. It was found by the writer, attached to a shell of *Rafinesquina alternata*, in a layer 300 feet above the base of the Trenton in the gorge of Roaring Brook, near Martinsburg, N. Y. The horizon is at the base of the *Rafinesquina deltoidea* zone. So far as is known, this is the first agelaerinitid to be found in the Ordovician rocks of New York State.

The most closely allied species is probably *C. multibrachiatus* (Raymond).¹ The type of that species has eight rays, though Dr. Raymond suggests that the normal number may prove to be seven. In the Canadian species, however, the periphery is still broader than in *C. raymondi*, the width being equal to one third of the diameter.

BRYOZOA.

PRASOPORA SIMULATRIX VAR. OCCIDENTALIS Ulrich.

Prasopora simulatrix var. *occidentalis* Ulrich, Pal. Minn., 1893, 3, p. 246, pl. 16, fig. 1, 2, 6, 7.

This species, and possibly others of like form, is extremely abundant from 160 to 280 feet above the base of the Trenton. It also occurs practically throughout the lower part of the Trenton. I do not wish to give the impression that all the hemispheric Bryozoa collected at Martinsburg belong to this species. Such is probably not the case. But from the scores of specimens collected, I examined sections of six taken at random. All of these proved to be *Prasopora simulatrix* var. *occidentalis*. While other genera may be represented in the many unexamined forms, the probability is that few, if any, do not belong to *Prasopora*.

ESCHAROPORA CONFLUENS Ulrich.

Escharopora confluens Ulrich, Pal. Minn., 1893, 3, p. 171, pl. 13, fig. 1-11.

I found this bryozoan very abundant in the basal beds. It occurs mostly as inch-long fragments not showing the mode of growth, but by removing a large slab of limestone from the bed of the creek, I uncovered some large branching specimens embedded in the soft shaly parting. One specimen was found to branch three times in a length of two inches.

BRACHIOPODA.

PSEUDOLINGULA RECTILATERALIS (Emmons).

Lingula rectilateralis Emmons, Geol. N. Y. Rept. 2d dist., 1842, p. 399, fig. 6.

This species occurred in Upper, Middle, and Lower Trenton. At horizon 180 I found a specimen protruding downwards from an over-

¹ Ottawa naturalist, 24, p. 60, pl. 1, fig. 2.

hanging stratum of limestone, the anterior margin being embedded in the matrix, and the posterior margin free below the rock. This was probably the position in which the animal lived, besides being the position in which it died, standing erect in the mud, as do the Lingulae to-day.

PLECTORTHIS sp.

In the Upper Trenton, near the state road, I found one specimen of Plectorthis, but, although it is in an excellent state of preservation and almost complete, it could not be identified with any described species. In a genus usually so common, I hesitate to make a new species from a single specimen.

RAFINESQUINA MINNESOTENSIS (Winchell).

Strophomena minnesotensis Winchell, Ninth ann. rept. Geol. nat. hist. survey Minn., 1881, p. 120.

This species is rather frequently listed of late, usually from formations of Black River or Stones River age. The horizon of the original specimens was, however, Lower Trenton, and it is gratifying that its first record from New York should be at that horizon. The fossil is very difficult to identify unless one has the interior of the brachial valve. Such a specimen was found, showing the large muscular area, the divergent ridges, and the shallow depression circumscribing the scars. It is also thickly dotted with "ovarian" markings.

STROPHOMENA TRENTONENSIS Winchell & Schuchert.

Strophomena trentonensis Winchell & Schuchert, Pal. Minn., 1893, 3, pt. 2, p. 389, pl. 30, fig. 41.

While this species has a wide distribution, specimens are seldom found. A pedicle valve obtained fifty feet above the base of the Trenton has the muscle scars somewhat smaller than in the Minnesotan type, and the two divergent ridges which should appear beside the median elevation in the muscular area are lacking. In spite of these variations, the smooth interior of the pedicle valve leaves little doubt of the correctness of the identification.

TRIPLECIA CUSPIDATA (Hall).

Plate 1, fig. 1-6.

Atrypa cuspidata Hall, Pal. N. Y., 1847, 1, p. 138, 318, pl. 33* (supplementary plate), fig. 1a-h: Hall & Clarke, Pal. N. Y., 1892, 8, pt. 1, p. 270.
Triplecia extans Hall & Clarke, Loc. cit, 1892, pl. 11c, fig. 1-3.

Without exception, *Triplecia cuspidata* is the most abundant fossil in the basal ten feet of the Trenton at Martinsburg, and a large number of complete specimens retaining both valves were collected. Most are large, specimens 18 mm. long and 25 mm. wide being common. Smaller specimens are also present in some numbers, but not the very young. Two specimens, one 9 mm. by 11 mm., another 20 mm. by 28 mm., probably represent the extremes of the range in size. The smaller of these is 6 mm. thick, the larger 17 mm. It proves in practice somewhat difficult to separate the various species of *Triplecia*. It will be remembered that Hall, at the end of his first work on Trenton fossils, came to the conclusion that *Atrypa extans* and *Atrypa cuspidata* were identical. *Triplecia nuclea* is easily recognized by its small size, sharp, narrow fold and sinus, and absence of radial striae. *Triplecia extans* and *T. cuspidata* are both striate, the latter much more strikingly so than the former. After examining a large number of specimens from Watertown, Martinsburg, Trenton Falls, and elsewhere, it would appear that *T. extans* is characterized by a rounded sinus, *T. cuspidata* by an angular or grooved sinus, and a new species, now to be named, by a flat-bottomed sinus.

In my judgment, one of the specimens figured by Hall and Clark as *Triplecia extans*, is a very typical *T. cuspidata*, and I have so assigned it above. It displays the typical angular sinus. Figures 6 and 7 of the same plate show the rounded sinus of *T. extans*.

The exact horizon at which the various species of *Triplecia* occur has not yet been determined. Hall stated that *T. cuspidata* was known to him as occurring only in the central part of the Trenton limestone at Lowville, a town only five miles north of Martinsburg. I did not have time to search for the original locality, but from the nearness of Lowville to Martinsburg it seems probable that the original specimens were really from the base of the Trenton, which is the only horizon in which this species is found at Martinsburg. In the M. C. Z. there are a great many specimens of this species from Watertown, N. Y., but unfortunately without exact data as to the horizon in the Trenton from which they were obtained. There are

also two large specimens in a fragment of rock from Trenton Falls. The matrix has on it the impression of a specimen of *Phragmolites*, thus showing that these two forms occur together at Trenton Falls as well as at Martinsburg.

TRIPLECIA SCHUCHERTI, sp. nov.

Plate 1, fig. 7-12.

Shell large, of about the same size and shape as that of *T. cuspidata*, but generally a little plumper. The length and thickness are nearly equal, the thickness equalling the length in some cases. The beaks of the opposite valves are so closely opposed as to practically eliminate a cardinal area. The brachial valve has a relatively narrow rounded fold which does not project at the front, and which is bordered by very shallow depressions. The fold is not so high and angular as in either *T. cuspidata* or *T. nuclea*, but more like that of *T. extans*. The sinus in the pedicle valve is rounded at the bottom in the posterior part of its course, but flat at the front and not deep. While this shell attains the large size of *T. cuspidata*, it evidently resembled *T. extans* in its younger stages, and is probably most nearly allied to that species.

The surface is marked by both concentric and radial lines, the latter, like those on *T. extans*, being most prominent toward the anterior margin of the shell. Large specimens of both this species and *T. cuspidata* often show obscure radial plications as well as striae.

The type (M. C. Z. S,534) selected as the best preserved of a dozen specimens at hand, is 22 mm. long, 28 mm. wide, and 21 mm. thick. A smaller specimen is 17 mm. long, 22 mm. wide, and 15.5 mm. thick. The largest is 24 mm. long, 31 mm. wide, and 20 mm. thick.

Seven of the specimens were collected by the writer from the base of the Trenton at Martinsburg, and there are five more in the M. C. Z. from the Trenton at Watertown, N. Y.

PARASTROPHIA ROTUNDA (Winchell & Schuchert).

Anastrophia? hemiplicata var. *rotunda* Winchell & Schuchert, Pal. Minn., 1893, 3, p. 383, pl. 30, fig. 32-35.

While it is the common custom to refer all the forms of *Parastrophia* found in the Trenton to one species, Winchell and Schuchert conferred a varietal name on a very rotund form which they obtained from the Galena (Prosser) limestone of Minnesota. I found in the lowest Trenton at Martinsburg three specimens of an equally rotund

Parastrophia, which, differing in many respects from the original specimens, may perhaps, considering the variability of the members of this genus, be included in the Minnesotan group, as a species rather than a variety.

Winchell and Seluchert state that their variety is "distinguished in having the length and width nearly equal, the valves more convex, and the plications somewhat more pronounced in the fold and sinus and less numerous in the lateral portions of the shell." No further description is given, but the single specimen figured is large (15 mm. long), has three broad plications on the fold, two in the sinus, and a pair on either side of the fold and sinus.

The three specimens found at Martinsburg are fully as convex as the Minnesotan specimen, but the largest is only 10 mm. long, and all have more and narrower plications in the fold and sinus. Two of them have four plications on the fold and three in the sinus, and the third, the largest, has four in the sinus. Two of them have two and one of them three plications on each side of the fold and sinus.

This rather detailed description is given because of the increasing necessity of more definite knowledge of the limits of variation, and the possibility of distinguishing species of *Parastrophia*.

PARASTROPHIA HEMPLICATA Hall.

Atrypa hemiplicata Hall, Pal. N. Y., 1847, 1, p. 144, pl. 33, fig. 10.

To assist in a study of *Parastrophia hemiplicata* which must ultimately be made, it is worth while to record the characteristics of any specimens whose horizon is definitely known. Fourteen specimens were found in the lower thirty feet of the Trenton, but a number of these were too poorly preserved to yield any satisfactory information. The following table shows the principal characteristics:

Length	Width	Thickness	Plications on fold	In sinus	On one side
9 mm.	11	6	5	4	2
10	11	6	5	4	2
11	14		5	4	3
10	11	7	6	5	3
14	15	8	7	6	3
11	13	10	4	3	2
10	14			3	3
12	14	8	4	3	3
14		14	4	3	2
10	13			4	2

It will be noted that all the specimens show plications on the sides of the fold and sinus. Moreover, there are obviously two distinct groups, one with four plications in the sinus of the young, and the other with only three plications in the sinus of the adult. The first five belong to the first group, and also, probably, the last one, while the other four belong to the second. The two specimens at the head of the list are evidently immature, as is shown by their thinness and their very short plications. With further growth new plications are added in the fold and sinus as well as at the sides, and number five is probably a typical adult.

No very young specimen of the second group has been found, but the presence of only three plications in the adult shows that it could not have been developed from such young as numbers one and two.

Only one specimen was collected from the Upper Trenton, a pedicle valve found about 400 feet above the base. It agrees with the second type in the table above, being 10 mm. long, 12 mm. wide, with three plications in the sinus and two on the sides.

Miss Wilson, in her studies of *Parastrophia hemiplicata* from about Ottawa (Mus. bull. 2, Geol. surv. Canada, 1914) found specimens with three to five plications in the sinus and plications on the sides of the fold in both Middle and Upper Trenton.

GASTROPODA.

SINUITES CANCELLATUS (Hall).

Bellerophon bilobatus Emmons, Geol. N. Y., 1842, 2, p. 392, fig. 6.

This species was found to be exceedingly common at horizon 70. It also occurred at horizons 15, 20, 390, and 410, but was not seen in the Middle Trenton. In the basal beds, where some other forms were so common, it was absent. At horizon 70, in actual numbers, as the following list shows, it many times exceeded in abundance all other forms collected. The fossils from this horizon, with the number of specimens collected, which the writer can attest to be a fair index to their relative abundance, are listed below:—

9 *Prasopora simulatrix* v. *occidentalis* Ulrich. 1 *Schizocrania filosa* Hall. 106 *Sinuites cancellatus* (Hall). 6 *S. cancellatus* v. *corrugatus* (Hall). 1 *Pleurotomaria* (*Trochonema*?) *ambigua* Hall. 1 *Hormotoma trentonensis* (Ulrich & Scofield). 4 *Ctenodonta levata* (Hall). 3 *Calymene senaria* Conrad — a total of 131.

CRUSTACEA.

CRYPTOLITHUS TESSELLATUS Green.

Cryptolithus tessellatus Green, Monog. N. Amer. trilobites, 1832, p. 73, pl. 1, fig. 4.

In Quebec, eastern New York, and central Pennsylvania, *Cryptolithus tessellatus* is one of the most common fossils in the lower part of the Trenton, but in Ontario, Wisconsin, Minnesota, and Iowa it has not yet been found. Even at Trenton Falls the species is so rare that it has been found only a few times by local collectors, who formerly spent a great deal of time searching for rare fossils in that vicinity. North of Trenton Falls and west of the Adirondacks it has not previously been reported.

The specimens, which were all found in one layer about 100 feet above the base of the section, seem to be quite typical, though all rather small. In front of the girder there are two rows of pits, and back of it at the sides there are three rows bordering the bases of the lateral mounds. In front of the glabella there are three rows of pits. Eye-lines are absent as is usual in the adult.